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(54) A vulcanisable rubber composition

(57) The invention relates to vulcanisable rubber compositions, which are formed from elastomeric material, filler substances and plasticiser process aids and contain vulcanising agents, the plasticisers being esters (such as diethyl phthalate) and/or naphthenic or paraffinic oils and being used in combination with liquid polymeric material (such as liquid polyisoprene) and/or asphaltenes. The vulcanisates produced therefrom do not cause discolouration and are environmentally friendly in respect of the plasticisers used.

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A VULCANISABLE RUBBER MIXTURE COMPOSITION

The invention relates to vulcanisable rubber mixture compositions, which contain elastomeric material, filler substances, process aids and vulcanising agents.

It is known to stretch the elastomeric materials contained in the rubber mixture composition, such as, for example, natural rubber, synthetic polyisoprene, solution- or emulsion-styrene-butadiene, polybutadiene or their mixtures, by using plasticisers as process aids.

For this purpose, commercially available products are preferably used in the form of a selective extract from petroleum refining of an aromatic nature; c.f. DE-A-1079316.

These so-called aromatic oils improve the plasticity of the rubber mixture composition and, in this respect, the processability of the highly viscous mixture ingredients. They reduce the hardness, the modulus and the elasticity of the vulcanisates.

Because of the aromatic oil, the vulcanisate has the disadvantageous property that, upon contact with other objects or, for example, floor surfaces, it stains such. To a greater or lesser extent, brown to black points of contact are formed on these surfaces, as can be observed with stored tyres, conveyor belts and similar objects. These dirty points of contact are difficult to remove or cannot be removed, and, in this respect, the dirty, oily location constitutes environmental pollution.

An object of the invention is to produce non-discolouring vulcanisates, the physical properties of which are not detrimentally affected by the plasticisers used if such vulcanisates are used as tyres, conveyor belts, or the like. The object of the invention is to replace the aromatic oil totally with other suitable process aids, which are compatible with any selected elastomeric materials, and which influence their processability in the sense of stretching in just as satisfactory a manner as do the aromatic oils hitherto used, without their having the disadvantage of environmental pollution.

A vulcanisable rubber mixture composition, which contains elastomeric material, such as, for example, natural rubber or synthetic polyisoprene, solution- or emulsion-styrene-butadiene or polybutadiene or their mixtures, and also contains filler substances, more especially active carbon black, as well as containing process aids and effective quantities of vulcanising agents, contains, according to the invention, the plasticiser in the form of an ester and/or in the form of a naphthenic or paraffinic oil, and liquid polymeric material, more especially selected from the polyisoprene group, up to 50 parts relative to 100 parts rubber.

Vulcanisates formed from such a rubber mixture do not have the disadvantage of prior art and, in particular, they do not cause discoloration.

Both the esters and the naphthenic and paraffinic oils and the liquid polyisoprenes are compatible with the main rubber component, which may be natural rubber or another of the above-described elastomeric

materials, and they cause the elastomeric material used at any time to be stretched satisfactorily.

The advantageous combination effect in the employment of said plasticiser and the liquid rubber component may also be achieved by using asphaltenes. Asphaltenes are environmentally friendly additives and may be mixed into the rubber mixture composition together with the liquid isoprene or instead of liquid isoprene and, together with the plasticisers used which are based on esters, such as, for example, dioctyl phthalate or naphthenic or paraffinic oil, asphaltenes produce satisfactorily stretched rubber mixtures which, in vulcanise form, do not cause discolouration and are environmentally friendly and, on average, they provide comparable physical data as when aromatic oils are used.

This is explained more fully with reference to examples of S-vulcanisable blended rubber mixtures, which are used as vulcanisates in pneumatic vehicle tyres.

The rubber mixture A is formed from

| | | |
|-----|------|-----------------------------------|
| 90 | pphr | Emulsion-styrene-butadiene rubber |
| 10 | " | Liquid polyisoprene |
| 75 | " | HAF carbon black |
| 20 | " | Dioctyl phthalate (DOP) |
| 2.5 | " | Zinc oxide |
| 1.0 | " | Stearic acid |
| 1.5 | " | Anti-oxidant |
| 1.0 | " | Wax/paraffin |
| 5.0 | " | Resin |
| 0.3 | " | DPG |
| 0.1 | " | ZBEC |

0.6 " CBS
1.8 " Sulphur

The physical properties of this vulcanisate are as follows after heating at 170° C for 10 minutes:

| | |
|---------------------------|---------------------------|
| Hardness (R.T.) | 63 Shore A |
| Modulus 300% | 10 M Pa |
| Breaking tension | 400% |
| Tensile strength | 14 M Pa |
| Rebound elasticity (R.T.) | 23% |
| DIN wear | 72 mm ² (R.T.) |

The rubber mixture B is formed from

| | | |
|-----|-----|-----------------------------------|
| 90 | pph | Emulsion-styrene-butadiene rubber |
| 10 | " | Liquid polyisoprene |
| 75 | " | HAF carbon black |
| 20 | " | DiOctyl phthalate (DOP) |
| 5 | " | Asphaltenes |
| 2.5 | " | Zinc oxide |
| 1.0 | " | Stearic acid |
| 1.5 | " | Anti-oxidant |
| 1.0 | " | Wax/paraffin |
| 0.3 | " | DPG |
| 1.3 | " | CBS |
| 1.9 | " | Sulphur |

The physical properties of this vulcanise are
as follows after heating at 170° C for 10 minutes:

| | |
|---------------------------|---------------------------|
| Hardness (R.T.) | 64 Shore A |
| Modulus 300% | 11.5 M Pa |
| Breaking tension | 400% |
| Tensile strength | 14 M Pa |
| Rebound elasticity (R.T.) | 23% |
| DIN wear | 95 mm ² (R.T.) |

CLAIMS

1. A vulcanisable rubber mixture composition, comprising:

an elastomeric material;

one or more filler substances;

one or more process aids in the form of plasticisers; and

one or more vulcanising agents;

wherein the plasticiser is in the form of an ester and/or a naphthenic or paraffinic oil, and the rubber mixture composition additionally contains a liquid polymeric material and/or one or more asphaltenes present in 1 to 50 parts per 100 parts rubber.

2. A vulcanisable rubber mixture composition as claimed in claim 1, wherein the elastomeric material is selected from natural rubber and/or synthetic polyisoprene and/or solution- or emulsion-styrene-butadiene and/or polybutadiene.

3. A vulcanisable rubber mixture composition as claimed in claim 1 or 2, wherein the filler substance is active carbon black.

4. A vulcanisable rubber mixture composition as claimed in any preceding claim, wherein the liquid polymeric material is a liquid polyisoprene.

5. A vulcanisable rubber mixture composition as claimed in any preceding claim, wherein the ester is dioctyl phthalate.

6. A vulcanisable rubber mixture composition as claimed in any preceding claim, substantially as hereinbefore described and exemplified.